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WITNESS my hand this
Twenty-seventh day of March 2003

S. Dragosavljevic

SMILJA DRAGOSAVLJEVIC
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION

Name of Applicant(s) John Gibbins

Address for Service: CULLEN & CO
Patent & Trade Mark Attorneys,
239 George Street
Brisbane Qld 4000
Australia

Invention Title: A Compaction Wheel

This invention is described in the following statement:

Field of the Invention

The present invention relates to a compaction wheel. In particular, the invention relates to a compaction wheel which includes a plurality of cleats removably mounted on a wheel rim.

The invention will be described by way of example with reference to it being mounted on a landfill/soil compactor. However, it should be appreciated that this is by way of example only and that the compaction wheel assembly may be mounted on other machines.

Description of the Prior Art

Machines such as landfill compactors are usually fitted with compaction wheels instead of crawler tracks or wheel and tyre assemblies. The compaction wheels are specifically designed to crush or compact material such as waste, soil and the like.

Compaction wheels of the aforementioned type generally include a cylindrical metal rim having a plurality of metal cleats circumferentially spaced around the rim and extending outwardly therefrom. The cleats function to improve the traction and compacting characteristics of the compaction wheels.

In the past, compaction wheels have typically been built with one-piece cleats that are welded, bolted or pinned to the rim. Also, in the case of two-piece cleats including a base and a harder, more wear-resistant cap, the base has been welded, bolted or pinned to the rim while the cap has been welded, bolted, or pinned to the base.

With use, the cleats become worn and need to be replaced. Prior cleat designs suffer from several drawbacks in this respect. For example, with the prior designs it is necessary to first dig foreign material such as mud or garbage from the exterior of the wheel to permit removal of the welds, pins or bolts. This is dirty and highly undesirable work. Moreover, in two-piece designs the pins or bolts are exposed to corrosive materials that can make them difficult to remove. Additionally, field replacement of the cleats typically requires that service vehicles carry expensive equipment such as air

compressors, air hammers, sledge hammers, torches and welding machines.

US patent 6,095,717 (Kaldenberg et al.) discloses a compaction wheel that overcomes many of the aforementioned deficiencies. The disclosed compaction wheel includes an outer rim having a plurality of cleat-receiving apertures extending therethrough and a plurality of replaceable cleats mounted on the outer rim. A plurality of annular rings is mounted inside the rim such that a pair of rings is located on opposite sides of each cleat-receiving aperture. Each cleat includes a ground-engaging portion and a lug extending from the ground-engaging portion. The cleats are mounted on the outer rim by inserting the lug of each cleat into an associated cleat-receiving aperture. Each cleat is secured to the outer rim by inserting a rod through an associated aperture which extends through the lug and annular rings associated with the lug. In use, compaction wheels according to the Kaldenberg et al. patent have been found to perform less than satisfactorily, as the cleats and rods tend to loosen with use causing the outer rim to wear prematurely

It is an object of the present invention to provide a cleat assembly which may overcome the above-mentioned disadvantages or provide the public with a useful or commercial choice.

Summary of the Invention

According to a first aspect of the present invention there is provided a compaction wheel including:

a cylindrical rim including an outer surface, an inner surface and a plurality of cleat-receiving apertures extending between the outer surface and the inner surface;

a plurality of cleats removably mounted on the rim such that each cleat engages with an associated said cleat-receiving aperture and extends from the outer surface of the rim, wherein each cleat includes:

a ground-engaging portion adapted to extend from the outer surface of the rim when the cleat is mounted on the rim;

a lug extending from the ground-engaging portion and adapted

to extend through an associated said cleat-receiving aperture when the cleat is mounted on the rim; and

a clip-receiving aperture extending through the lug such that the clip-receiving aperture is adjacent the inner surface of the rim when the cleat is mounted on the rim, and

a plurality of spring clips that are each adapted to secure an associated said cleat to the rim when the cleat is mounted on the rim such that the clip extends through the clip-receiving aperture of the cleat, engages with the inner surface of the rim and biases the ground-engaging portion of the cleat against the outer surface of the rim.

According to a second aspect of the present invention there is provided a cleat assembly for a compaction wheel including a cylindrical rim having an outer surface, an inner surface and a plurality of cleat-receiving apertures extending between the outer surface and the inner surface, wherein the cleat assembly includes:

a cleat removably mountable on the rim such that the cleat engages with an associated said cleat-receiving aperture and extends from the outer surface of the rim, wherein the cleat includes:

a ground-engaging portion adapted to extend from the outer surface of the rim when the cleat is mounted on the rim;

a lug extending from the ground-engaging portion and adapted to extend through an associated said cleat-receiving aperture when the cleat is mounted on the rim; and

a clip-receiving aperture extending through the lug such that the clip-receiving aperture is adjacent the inner surface of the rim when the cleat is mounted on the rim, and

a spring clip adapted to secure the cleat to the rim when the cleat is mounted on the rim such that the clip extends through the clip-receiving aperture of the cleat, engages with the inner surface of the rim and biases the ground-engaging portion of the cleat against the outer surface of the rim.

In a preferred form, a pair of clip-receiving apertures extends through the lug of a cleat while the spring clip associated with the cleat is resilient and

generally U-shaped and has a pair of arms that are each adapted to extend through an associated said clip-receiving aperture. Preferably, the spring clip is adapted such that when the arms extend through the clip-receiving apertures, each arm is biased towards an interior surface of an associated clip-receiving aperture. Moreover, the configuration of the clip is preferably such that generally only the end portions of the arms engage with the inner surface of the rim.

Preferably, the cleats and cleat-receiving apertures are configured so that there can be substantially no relative movement between the cleats and the rim when the cleats are mounted thereon as such movement can cause the cleat and the rim to wear prematurely.

In a preferred form, the rim may include a mounting disc which partitions the interior of the rim. The mounting disc is preferably adapted to enable the rim to be mounted to an axle of a machine such as a landfill compactor.

In order that the invention may be more fully understood and put into practice, a preferred embodiment thereof will now be described with reference to the accompanying drawings.

Brief Description of the Drawings

Fig. 1 is a part sectional end elevation of a portion of a compaction wheel according to an embodiment of the present invention which includes a first type of cleat mounted to a compaction wheel rim;

Fig. 2 is a part sectional side elevation of the portion of the compaction wheel illustrated in Fig. 1 which includes a spring clip securing the cleat to the rim of the wheel;

Fig. 3 is a part sectional end elevation of a portion of the compaction wheel illustrated in Fig. 1 which includes a second type of cleat mounted to the compaction wheel rim;

Fig. 4 is a part sectional side elevation of the portion of the compaction wheel illustrated in Fig. 3 which includes a spring clip securing the cleat to the rim of the wheel;

Fig. 5 is an interior view of a compaction wheel according to an embodiment of the present invention which shows the lug of a cleat extending through the rim prior to the cleat being secured to the rim with a spring clip;

Fig. 6 is an interior view of a compaction wheel according to an embodiment of the present invention which shows the lug of a cleat extending through the rim when the cleat has been secured to the rim with a spring clip;

Fig. 7 is a perspective view of a compaction wheel rim according to an embodiment of the present invention;

Fig. 8 is a sectional side elevation of the compaction wheel illustrated in Fig. 7; and

Fig. 9 is a perspective view of the compaction wheel illustrated in Fig. 7 having a plurality of cleats mounted thereto.

Detailed Description

Figs. 1 and 2 illustrate a portion of an embodiment of a compaction wheel 10. The compaction wheel 10 includes a cylindrical rim 11 and a plurality of cleat assemblies 12 (note that only one is shown) mounted on the rim 11. The compaction wheel 10 is of a type that can be mounted on landfill compactors.

The rim 11 is in the form of a hollow cylinder and includes an outer surface 20, an inner surface 21 and an interior 22 which is bordered by the rim 11. The rim 11 is formed from a suitable material such as steel.

Referring to Figs. 7 and 8, a plurality of cleat-receiving apertures 23 extend between the outer surface 20 and the inner surface 21 of the rim 11. The cleat-receiving apertures 23 are arranged into a plurality of spaced bands 24 to 29 extending around the circumference of the rim 11 such that each band 24 to 29 includes a plurality of circumferentially spaced cleat-receiving apertures 23. Each cleat-receiving aperture 23 has a rectangular transverse cross-section defined by parallel opposing side-walls. The cleat-receiving apertures 23 are preferably formed in the rim 11 after the rim has been formed into a cylindrical shape.

A mounting disc 30 is located inside the rim 11 and is suitably attached

thereto by welding or other appropriate means. The mounting disc 30, which partitions the interior 22 of the rim 11 into two regions, is adapted to enable the rim 11 to be mounted on an axle of an earth-moving machine such as a landfill compactor. In particular, the mounting disc 30 includes a plurality of lug-receiving apertures 31 that are each adapted to receive an associated threaded lug which extends from the axle of the landfill compactor.

Again referring to Figs. 1 and 2, cleat assembly 12 includes a first type of cleat 40 and a spring clip 41. Cleat 40 is removably mounted on the rim 11 such that it engages with an associated cleat-receiving aperture 23 and extends from the outer surface 20 of the rim 11. Cleat 40 is secured to the rim 11 by the spring clip 41. The cleat 40 and spring clip 41 are formed from a suitable material such as steel.

Cleat 40 includes a ground-engaging portion 50 which is adapted to extend from the outer surface 20 of the rim 11 when the cleat 40 is mounted on the rim 11. The ground-engaging portion 50 includes a base 51 which is generally in the form of a rectangular prism having a curved underside which is adapted to rest against the curved outer surface 20 of the rim 11. The ground-engaging portion 50 also has a pair of opposing trapezoid-shaped sides 52, 53, a pair of rectangular-shaped sides 54, 55, and a rectangular-shaped upper side 56. The cleat 40 is configured so that the trapezoid-shaped sides 52, 53 are perpendicular with respect to a longitudinal axis of the rim 11. The rectangular-shaped sides 54, 55 extend between the trapezoid-shaped sides 52, 53.

A lug 57 extends from the ground-engaging portion 50. The lug 57 is adapted to extend through an associated cleat-receiving aperture 23 when the cleat 40 is mounted on the rim 11. The lug 57 is substantially in the form of a rectangular prism and has transverse cross-sectional dimensions which are slightly less than those of the cleat-receiving aperture 23. This allows the lug 57 to be readily inserted into and removed from the cleat-receiving aperture 23 whilst minimising lateral movement of the lug 57 relative to the aperture 23 when the lug 57 is inserted into the aperture 23.

A pair of clip-receiving apertures 58, 59 extend through the lug 57 such

that the apertures 58, 59 are adjacent to the inner surface 21 of the rim 11 when the cleat 40 is mounted on the rim 11. Further, the clip-receiving apertures 58, 59 are oriented such that they are parallel with respect to the longitudinal axis of the rim 11 when the cleat 40 is mounted on the rim 11.

Referring to Figs. 5 and 6, the spring clip 41 is resilient and generally U-shaped and includes a pair of arms 60, 61 that are each adapted to extend through an associated clip-receiving aperture 58, 59. A distal end 62 of each arm 60, 61 is pointed and includes a tapered portion 63 which is adapted to assist in guiding the arms 60, 61 into the apertures 58, 59. Each arm 60, 61 also includes an indented portion 64 which is slightly longer than the length of the clip-receiving apertures 58, 59. The clip 41 is adapted to secure the cleat 40 to the rim 11 such that each arm 60, 61 extends through an associated clip-receiving aperture 58, 59 such that the indented portions 64 of the arms 60, 61 are substantially located within the clip-receiving apertures 58, 59. In particular, the spring clip 41 is adapted such that when the arms 60, 61 extend through the clip-receiving apertures 58, 59, each arm is biased towards an interior surface of an associated clip-receiving aperture 58, 59. This biasing together with the indented portions 64 assists in preventing the spring clip 41 from working loose and allowing the cleat 40 to become detached from the rim 11.

To secure the cleat 40 to the rim 11, the spring clip 41 is firstly positioned in the manner illustrated in Fig. 5. The arms 60, 61 are then inserted into the apertures 58, 59 by striking a bridging portion 65 of the spring clip 41 towards the lug 57 until the indented portions 64 coincide with the clip-receiving apertures 58, 59 as illustrated in Fig. 6.

Referring to Fig. 2, the spring clip 41 is configured so that when it secures the cleat 40 to the rim 11, the spring clip 41 engages with the inner surface 21 of the rim 11 and biases the cleat 40 towards the interior 22 of the rim 11. In particular, the configuration of the spring clip 41 is such that end portions 66 of the spring clip 41 engage with the inner surface 21 of the rim 11. The indented portions 64 of the arms 60, 61 are also adapted so that the ground-engaging portion 50 of the cleat 40 is biased against the outer surface

20 of the rim 11.

While the spring-clip 41 can be detached from the cleat 40 by simply reversing the above-described procedure, it can be easier to simply cut the bridging portion 65 of the spring clip 41 with an oxyacetylene torch or other suitable apparatus and then individually remove the arms 60, 61 from the apertures 58, 59.

Referring to Figs. 3 and 4, a second type of cleat 70 is shown mounted to the rim 11.

Cleat 70 differs from cleat 40 in that the ground-engaging portion 50 of cleat 70 has been modified. In particular, the trapezoid-shaped sides 52, 53 of the ground-engaging portion are parallel with respect to the longitudinal axis of the rim 11.

The compaction wheel 10 including a plurality of cleats 40, 70 mounted to the rim 11 is illustrated in Fig. 9. For clarity, the spring clips 41 have not been shown. The different orientation of the cleats 40, 70 is clearly shown. Also, it is clear that the orientation of the lugs 57 of all the cleats 40, 70 relative to the rim 11 is the same and that the apertures 58, 59 of all the cleats 40, 70 are parallel with respect to the longitudinal axis of the rim 11.

The cleats 40, 70 are mounted on the rim 11 such that they are arranged into a plurality of lines which extend diagonally across the outer surface 20 of the rim 11. The cleats 40, 70 of one such line have each been referenced as A. It should be appreciated though that the cleats 40, 70 may be arranged in a different manner. For example, the cleats 40, 70 may be arranged into lines which extend across the outer surface of the rim 11 and are parallel with the longitudinal axis of the rim 11. Alternatively, the cleats 40, 70 may be arranged to form chevrons on the outer surface of the rim 11.

The foregoing describes only some embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention.

For example, hardened, punched steel sleeves (not shown) may line the sidewalls of the cleat-receiving apertures 23. Each sleeve may include a lip to prevent them from falling through the apertures 23 when they are initially

inserted into the apertures 23. Alternatively or in addition to a lip, the sleeves may be tack-welded to the rim 11. The tack-welds should be such that they can be readily cut or otherwise broken so that the sleeves may be removed from the apertures 23. The hardened sleeves would function to prevent the cleat lugs 57 from rubbing directly against the rim 11 in the event that there was some play between the cleats lugs 57 and the apertures 23. Such rubbing would likely cause the rim 11 to wear prematurely as the rim 11 is usually constructed from unhardened steel.

DATED this 20th day of March 2002

JOHN GIBBINS

By his Patent Attorneys

CULLEN & CO.

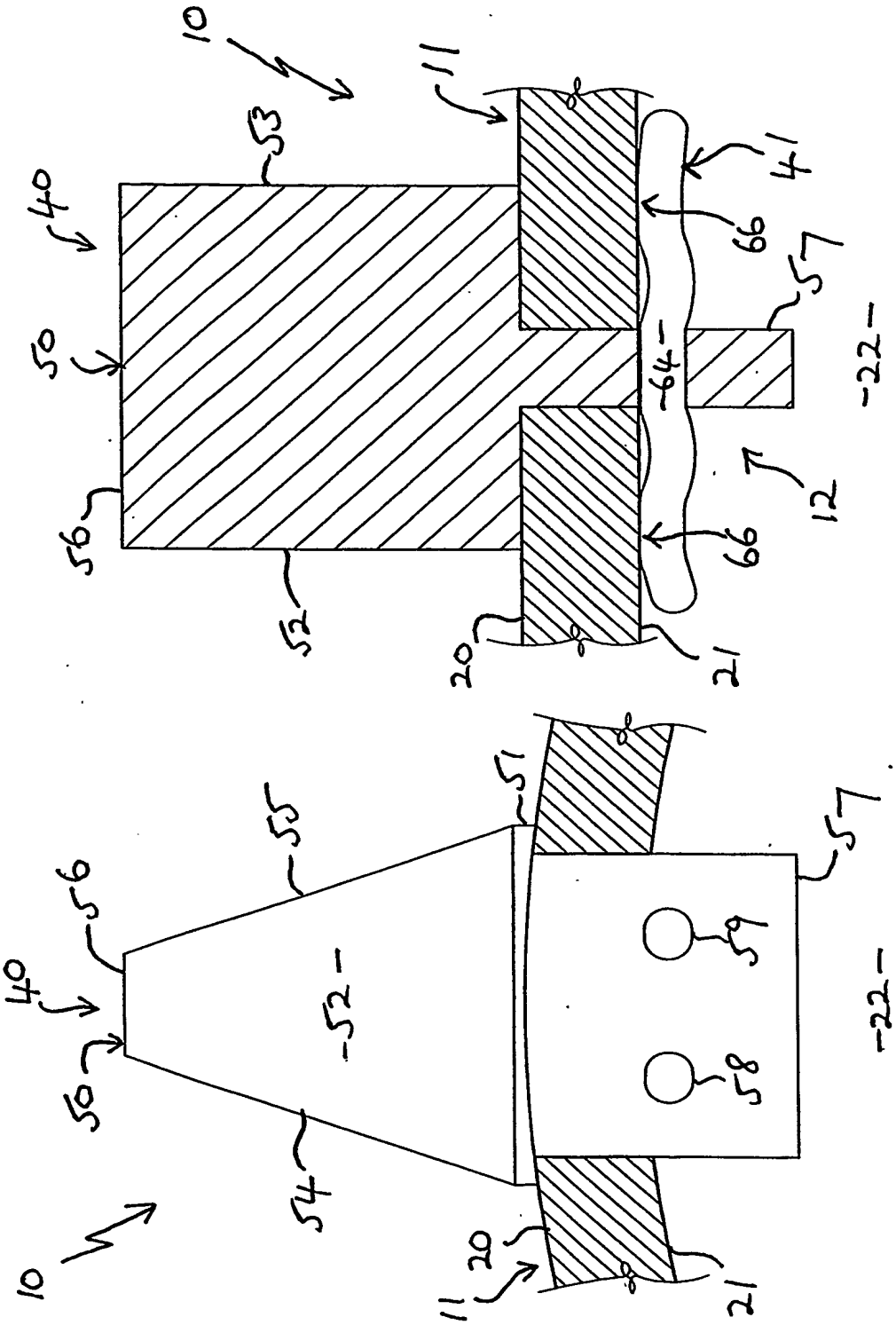

FIG. 2

FIG. 1

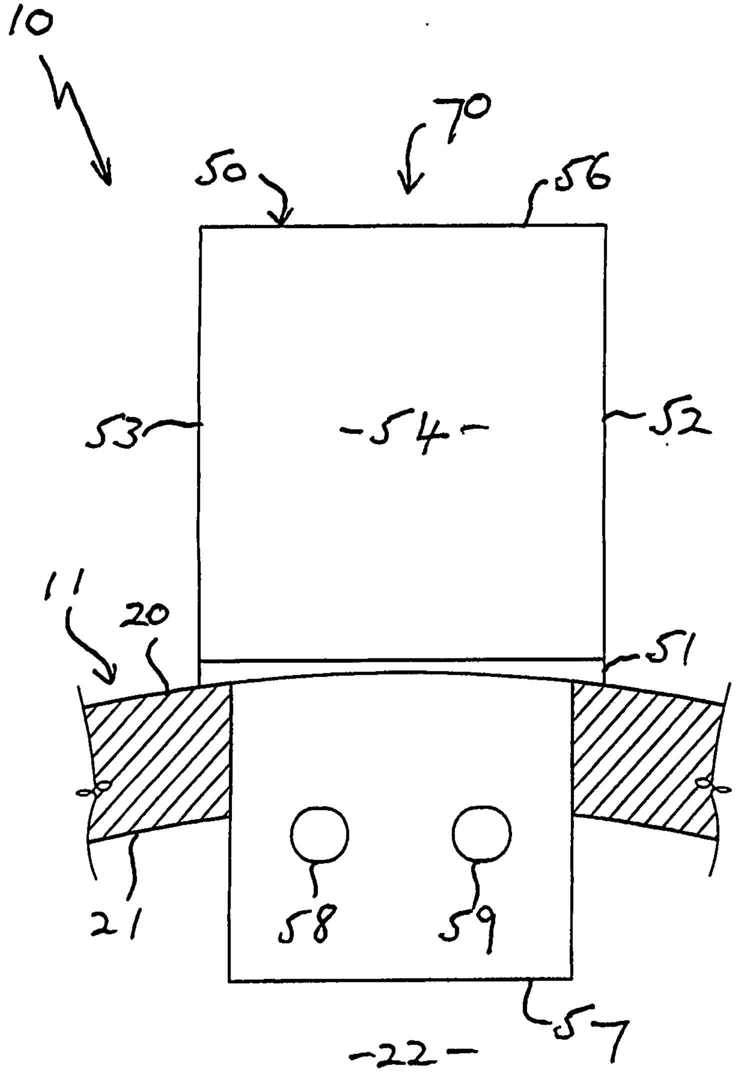
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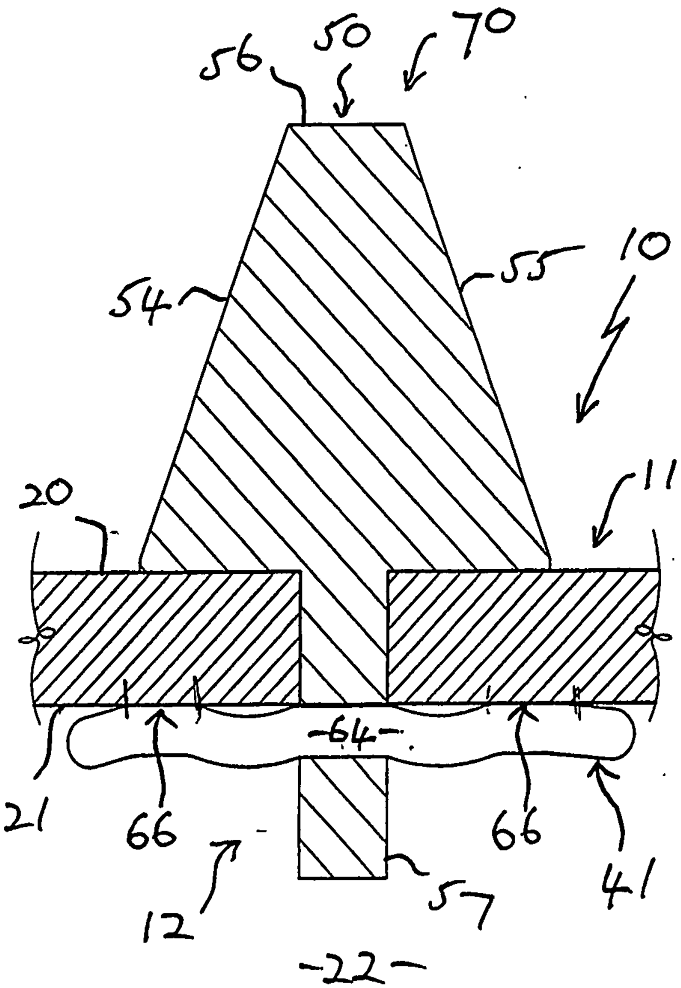
FIG.3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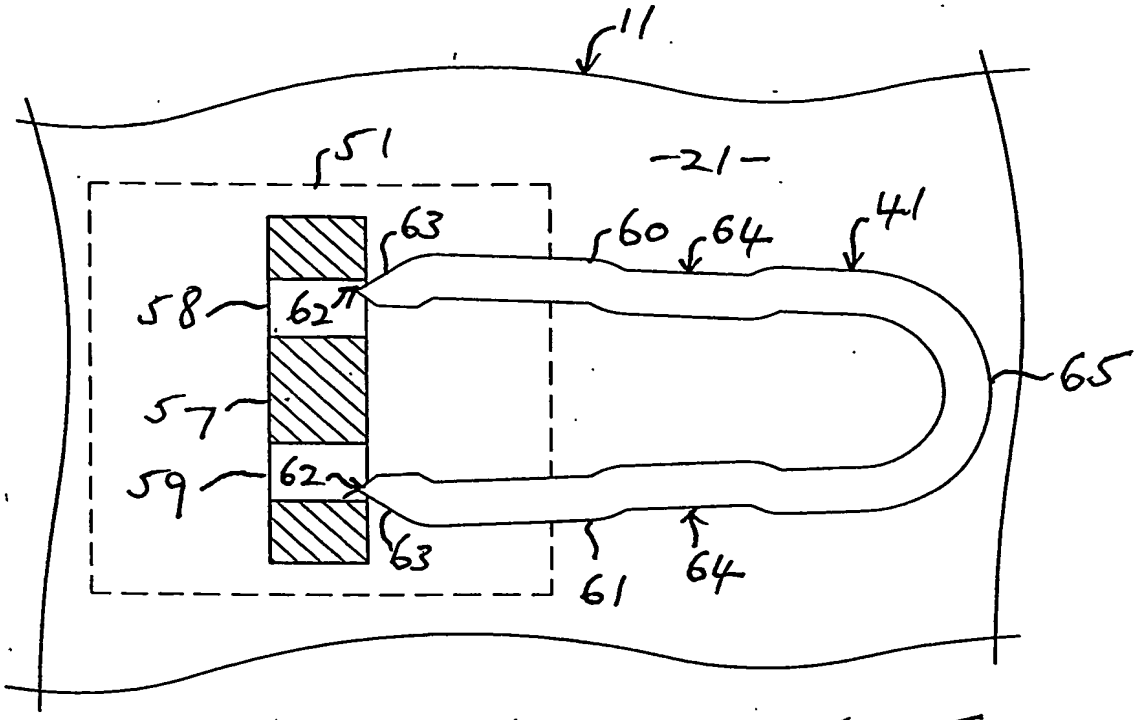
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FIG. 5

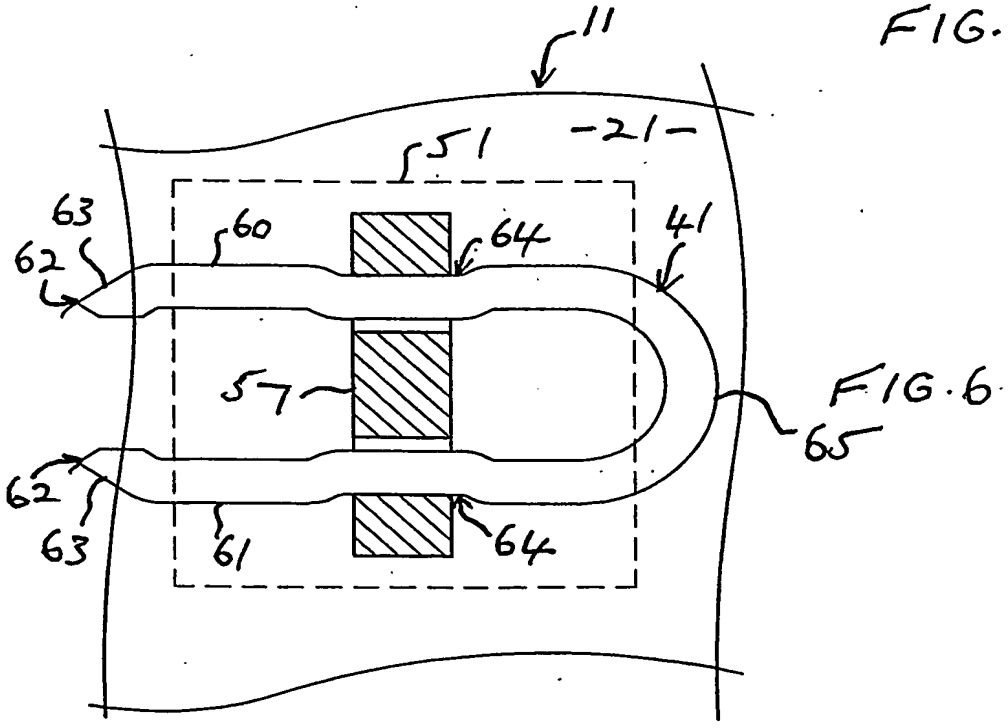
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FIG. 6

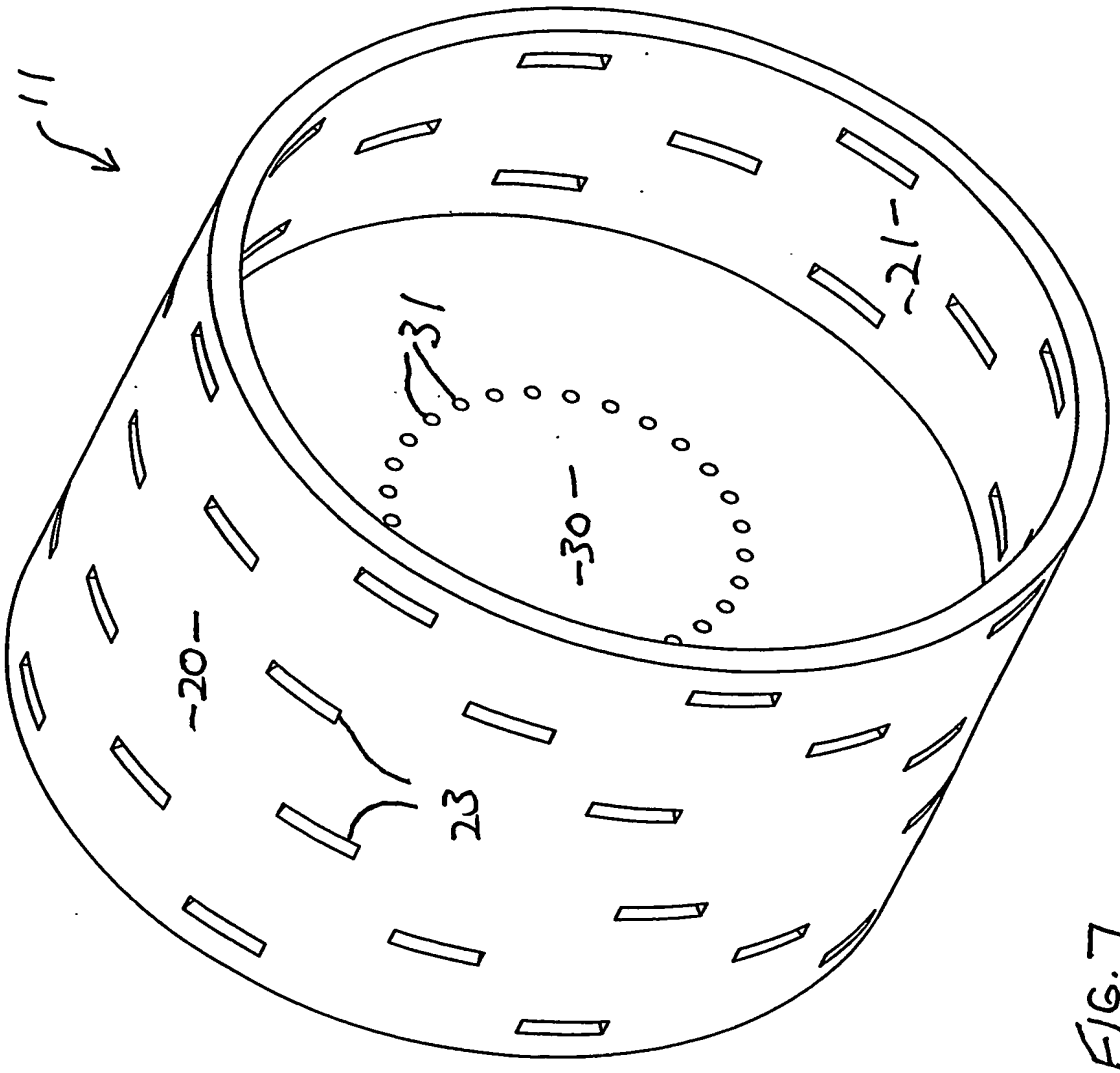
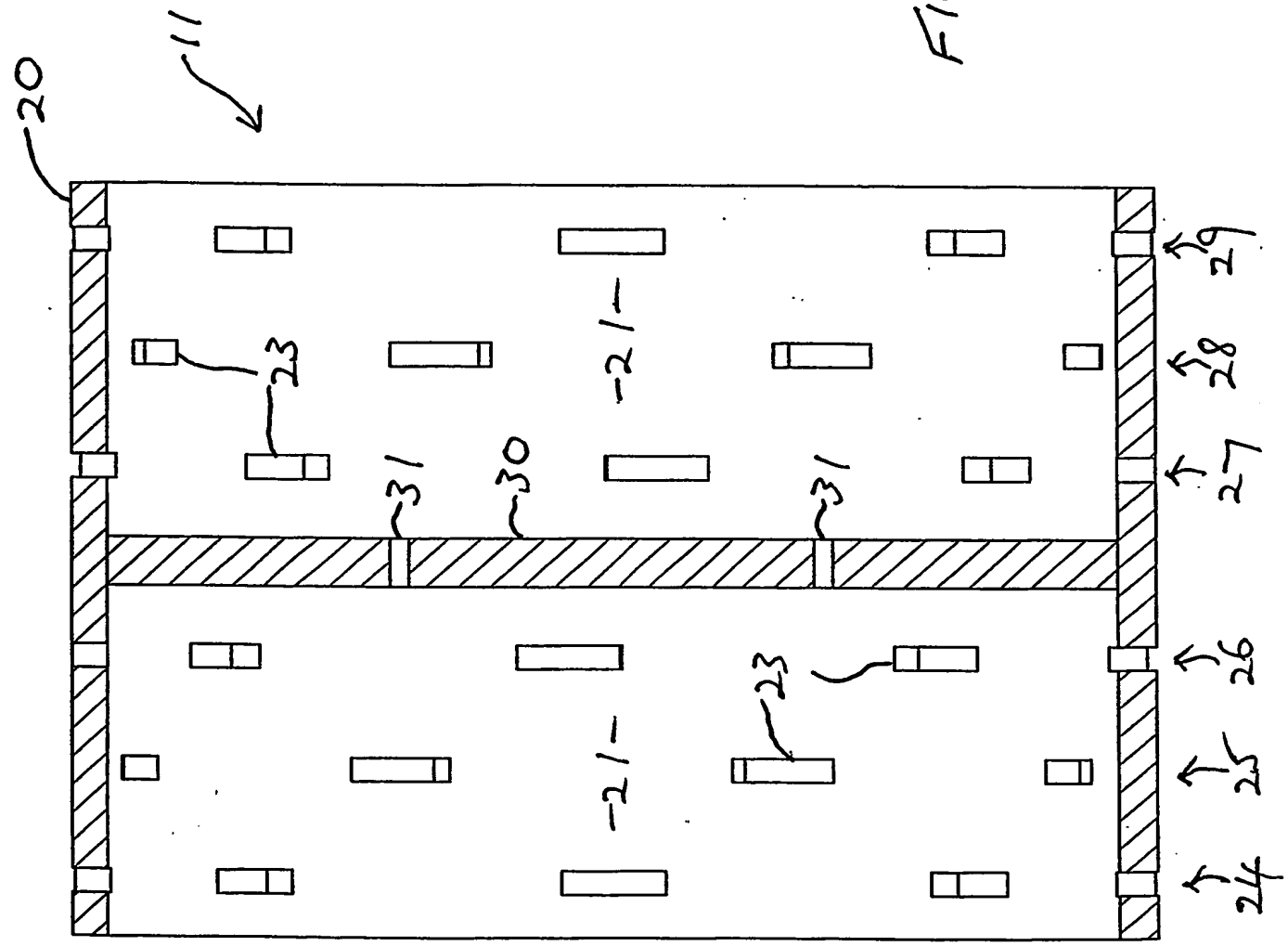


FIG. 7

FIG. 8



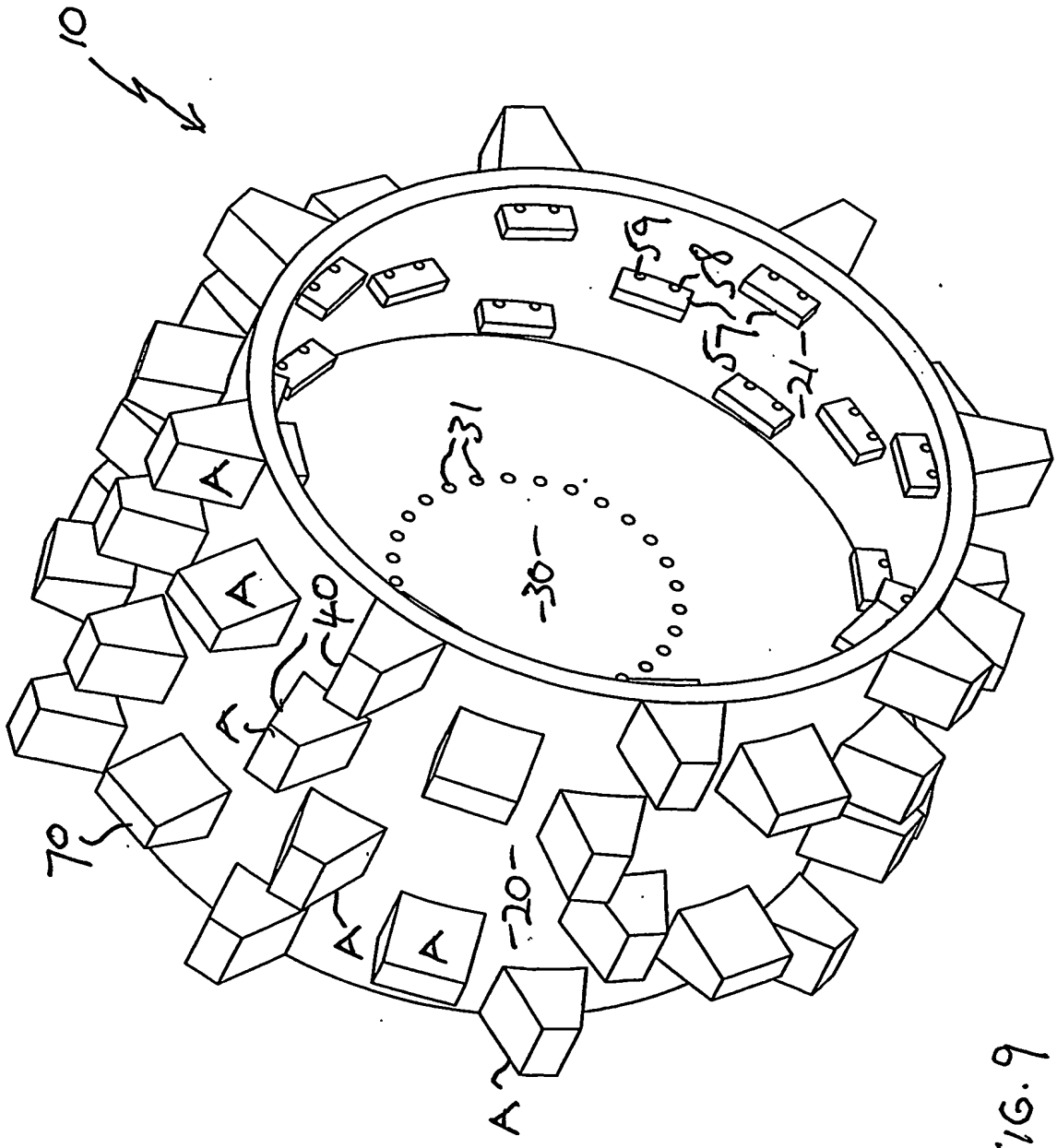


FIG. 9